REMARKS

The Office Action of June 4, 2004 has been reviewed, and the Examiner's comments carefully considered. The present Amendment amends claims 65 and 66 and adds new claims 67 and 68, all in accordance with the originally-filed specification. Support for these amendments can be found, for example, in paragraphs 37-44 of the application. Claims 1-68 are pending in this application, and claims 1, 33 and 65-68 are in independent form.

Initially, the Examiner is requiring a new oath or declaration, indicating that the oath or declaration on file incorrectly states that the priority application, namely European 99 203 477.7, has a priority filing date of October 22, 1998, as opposed to a priority filing date of October 22, 1999. Enclosed herewith is a modified and executed "Declaration and Power of Attorney for Patent Application," which has been signed by both inventors in this application. Applicants believe that this new submission will satisfy the Examiner's concerns regarding the Oath/Declaration.

Next, the Examiner has rejected claims 33-66 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. In particular, the Examiner requires clarification regarding his belief that "if the objective function in claims 33 and 66 is to be optimized for each trace position separately, it is unclear to the Examiner what aspect of optimizing the objective function is simultaneous and what it is simultaneous to." Also with respect to claim 65, the Examiner requires further clarification on the intended scope of this claim. Based upon the foregoing amendments and the following remarks, Applicants respectfully request reconsideration of these rejections.

First, with respect to claim 65 and the Examiner's Section 112 rejection of this claim, Applicants submit that the "weighted difference between measured reflection data and synthetic reflection data" refers to the $F_{Seismic}$ term of the objective function, while the correction and/or stabilization terms relate to one or more of various functions, including $F_{reflectivity}$, $F_{contrast}$, $F_{initial}$, $F_{functions}$, $F_{lateral}$ and F_{time}. This means that the weighted difference is the weighted difference between measured reflection data and synthetic reflection data. The stabilization operation is performed by optimizing an objective function, which comprises $F_{seismic}$, which is the weighted difference between measured reflection data and synthetic reflection data, and one or more of the various stabilization terms set forth above.

With respect to the Examiner's rejection of claims 33 and 66, and the use of the terms "simultaneously" and "separately" in the various portions of these claims, Applicants submit the following. Independent claims 1 and 66 are directed to a method and device for determining, from measured reflection data on a plurality of trace positions, one or more subsurface parameters. Accordingly, the optimization process may be performed for only one subsurface parameter. In addition, and as set forth in these claims, the optimizing of the objective function is for a plurality of trace positions simultaneously. This means that the method and device of claims 1 and 65 use a plurality (2 or more) of trace positions simultaneously for optimizing the objective function. Either only one subsurface parameter or more than one subsurface parameter may be used in the optimization process. However, it should be noted that the simultaneous optimization of one or more trace adds considerable robustness to the method. In particular, as discussed in paragraphs 37 and 38 of the specification of the present application, this situation is directed to the optimization of the following objective function:

$F(parameter_1, \ldots, parameter_{\#parameters}) = F_{seismic}$ = *function depending on summation of the residual traces*

Therefore, only after the residual traces are added, the optimization process takes place, and therefore the optimization takes place for a plurality of traces (or trace positions) simultaneously.

It should be noted that claims 1 and 65 reflect independent claim 1 of now-issued U.S. Patent No. 6,665,615. However, in the '615 patent, the method included a plurality of trace positions and a plurality of subsurface parameters. In the present application, independent claim 1, while substantially duplicative of independent claim 1 of the '615 patent, is directed to one or more subsurface parameters, such that independent claim 1 of the present application includes a method for determining from measured reflection data on a plurality of trace positions and one subsurface parameter.

With respect to independent claims 33 and 66 of the present application, these claims are directed to a method and device that determine, from measured reflection data on one or more trace positions, a plurality of subsurface parameters. In addition, these claims relate to the simultaneous optimization of the objective function with a plurality of subsurface parameters and for each trace position separately. This means that the method and device of these claims use a plurality (two or more) of subsurface parameters simultaneously in the optimization of the objective function. Again referring to paragraphs 37 and 38 of the specification of the present application, if this situation arises during optimization of the following objective function,

$F(parameter_1,\ldots,parameter_{\#parameters}) = F_{seismic} = function\ depending\ on\ modeled\ seismic\ data\ (m_{i,j})$

Further, $F_{seismic}$ depends on the parameters, since it depends on the modeled seismic data. The modeled seismic data may be computed using only one subsurface parameter, e.g., acoustic impedance, or using a plurality of subsurface parameters, e.g., pressure wave velocity, shear wave velocity, density, etc. Claims 33 and 66 are set forth to cover the situation where a plurality of subsurface parameters are used to provide the modelled seismic data. Accordingly, since $F_{seismic}$ includes the modeled seismic data, $F_{seismic}$ is optimized using two or more subsurface parameters

simultaneously. The simultaneous optimization of the objective function using two or more subsurface parameters also makes the optimization process more robust, since using modelled (synthetic) reflection data that is computed with a plurality of subsurface parameters will better approximate the measured reflection data. Applicants respectfully submit that simultaneous optimization using two or more subsurface parameters has not been suggested in any of the cited prior art of record.

Applicants respectfully submit that this discussion adequately describes the difference between claims 1, 33, 65 and 66, especially with respect to: (1) optimizing an objective function for a plurality of trace positions simultaneously (claims 1 and 65); and (2) simultaneously optimizing the objective function using a plurality of subsurface parameters for each trace position separately (claims 33 and 66). However, in order to provide additional clarity, Applicants further submit that the term "separately" in independent claims 33 and 66 relates to the situation where the objective function is optimized for each trace separately, meaning that the objective function is optimized for a first trace, then the objective function is optimized for a second trace, then the objective function is optimized for a third trace, etc. Therefore, when referring to the formula found in paragraph 38 of the present application, a number of traces (#trace) is equal to 1. This means that the word "separately" indicates that #trace = 1.

On the other hand, when using the term "simultaneously" with respect to two or more trace functions, and with reference to the optimization of the objective function, #trace $\geq$ 2. The residual trace is first calculated by summing up the residual traces, and afterwards optimized. Therefore, the objective function has been optimized for two or more traces simultaneously. Based upon these remarks and explanation, Applicants respectfully request reconsideration of the Examiner's Section 112, second paragraph, rejection of claims 33-66.

New claims 67 and 68 have been added by the foregoing amendment. In

particular, new claims 67 (method) and 68 (device) are directed to the determination, from measure reflection data on a plurality of trace positions, of one or more subsurface parameters. In new independent claim 67, the method includes the steps of (a) preprocessing the measured reflection data into a plurality of partial or full stacks; (b) specifying one or more initial subsurface parameters defining an initial subsurface model; (c) specifying a wavelet or wavelet field for each of the partial or full stacks of the measured reflection data; (d) calculating synthetic reflection data based on the specified wavelets and the initial subsurface parameters; (e) optimizing an objective function, the objective function comprising the weighted difference between measured reflection data and synthetic reflection data, and one or more stabilization terms and one or more corrections terms, for a plurality of trace positions simultaneously; and (f) outputting the optimized one or more subsurface parameters.

New claim 68 includes input means for inputting at least the measure reflection data and one or more initial subsurface parameters defining an initial subsurface model. The device also includes a processing means for: (i) preprocessing the measured reflection data into a plurality of partial or full stacks; (ii) specifying a wavelet or wavelet field for each of the partial or full stacks of the measured reflection data; (iii) calculating synthetic reflection data based on the specified wavelets or wavelet fields and the initial subsurface parameters; and (iv) optimizing an objective function, comprising the weighted difference between measured reflection data and synthetic reflection data, and one or more stabilization terms and/or one or more correction terms for a plurality of trace positions simultaneously. Finally, an output means is used for outputting optimized one or more subsurface parameters.

Like independent claims 1, 33, 65 and 66, new independent claims 67 and 68 define over the prior art of record and are in condition for allowance. Further, these claims are subject to the submitted Terminal Disclaimer, as discussed hereinafter.

The Examiner has rejected claims 1-66 under the judicially created doctrine of obviousness-type double patenting. In particular, these claims have been rejected over claims 1-44 of the '615 patent. Enclosed herewith and incorporated herein by reference is a Terminal Disclaimer. The filed Terminal Disclaimer overcomes the double patenting rejection over the '615 patent. Withdrawal of this double patenting rejection is respectfully requested.

For all the foregoing reasons, Applicants believe that claims 1-68, as amended and added, are patentable over the cited prior art and in condition for allowance. Reconsideration of the rejections and allowance of all pending claims 1-68 are respectfully requested.

Respectfully submitted,

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